

Evaluating investment fund performance in Portugal

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Abstract: The investment fund market has not only attracted increasing interest from investors seeking alternative investments but has also become increasingly important among professionals and academics. Within this framework, this study seeks to contribute to the research developed through identifying the inducers of investment fund performance in Portugal. The sample consists of 78 funds, covering the timeframe from 2006 to 2016, incorporating stock funds, bond funds, mixed funds and treasury funds analysed in accordance with the panel data methodology. This work finds variables such as risk, rotation, size, age, interest rates, commissions and benchmarks as highly significant determinants of mutual fund performance and when followed by mutual fund managers, may enhance their returns. The originality and value of the work stands on completing certain gaps and deepen knowledge about the Portuguese market, carrying out additional research on the funds marketed in Portugal, focusing on a more diversified asset market, expanding both the number of funds under study and the sampling period while seeking to identify the most relevant factors for performance and how they condition it. The main limitation of this study stems from the difficulties of collecting information due to limitations imposed by current data protection legislation, which restricted both the scope and the depth of analysis. When choosing the Portuguese context, we face constraints in comparison with studies made in more developed contexts where this theme has been studied for a longer period of time.

JEL Classifications: G11, G14, G15, G23

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1. Introduction

As an alternative channel, the investment fund industry has grown steadily over recent years, thus encouraging further research on this subject. The literature review conveys the difficulties in encountering consensus among the authors about the main drivers of profitability and the role they play. Moneta (2015) and Makni et al. (2016) argue that levels of manager experience and ability represent important factors in generating positive returns that cover transaction costs and fees, benefiting from economies of scale, cost sharing, outperforming benchmarks and delivering the best returns on investment. Contrary to these results, Gil-Bazo et al. (2009) and Drago et al. (2010) conclude that in many circumstances manager efforts to obtain better results are unsuccessful due to the heavy load of commissions levied on the management and transaction of assets. In turn, Stafylas, Anderson, & Uddin (2016), suggest that the portfolio composition requires an ideal size as above a certain level the increase in costs does not translate into a proportional increase in profitability. Another factor that may influence this trend derives from funds being managed by large teams, providing organizational diseconomies and managerial experience who, when at the beginning of their careers, need learning periods

(Pollet et al., 2008). Other authors (Makni et al., 2016 and Phillips et al., 2017) do not identify any inducers of statistical significance for fund performance.

In recent decades, the number of studies on European markets has risen even while they still remain highly insufficient when compared with the other markets. In the Portuguese context, they are even scarcer, and the studies developed focus only on specific markets and on a limited range of funds. In order to complete some of these gaps and deepen knowledge about the Portuguese market, this study carries out additional research on the funds marketed in Portugal, not only focusing on a more diversified asset market but also expanding the number of funds studied and the sampling period, in order to identify both the most relevant factors of performance and their conditioning effects.

In Portugal, the first legal instrument - Decree-Law 46302/65 (MFP, 1965) - on investment funds was enacted on April 27, 1965 established the general rules for exercising banking institution activities (company fund management investment). In accordance with the first regulation in this area, Banco Nacional Ultramarino then applied for authorization to set up the first management company and obtaining authorization through Decree-Law 47571/67 (MFA, 1967). Information sourced from the Portuguese Securities Market Commission (CMVM, 1999) verifies how investment policies in Portugal have changed over the years. In 1994, a major proportion of capital went into monetary and public debt applications, accounting for about 51% and 28% respectively. Investment in shares and bonds represented only 3% and 16% respectively. 1999 saw the beginning of an increase in investments in the stock and bond markets, rising to 18% and 33%, to the detriment of monetary and public debt applications that fell back to 14% and 12%. Since the first fund launched in mid-1986, the industry grew strongly in terms of the number of funds and management companies through to 1999 with 20 management companies and 311 funds in the market in that year. From that period onwards, the market gradually slowed, registering a sharp decline around 2000-2001 caused by a sharp drop in the stock market following the global technology sector crisis that led to the closure of thousands of companies around the world. In 2001, the attacks on the Twin Towers and the Pentagon again shook the markets and the amounts under management in Portugal decreases in terms of its GDP (Gross Domestic Product) weighting by around 5% in comparison to 1998 (CMVM, 2002). After this troubled period, the data portrays evidence of recovery in the amounts under management, motivated by activity in real estate investment funds, albeit clearly lower than in 1986. This positive evolution was not, however, accompanied either by the number of companies in business or by the number of funds. In the period under analysis (2006-2016), there was a decrease of about 51% in the number of active funds and of 16% in the amounts under management even while the management companies experienced only a lesser decrease of 7%. Regarding management company market share, there was the notable concentration of fifteen companies into five entities over a number of years, which now account for more than 80% of the total value transacted over the last decade (CMVM, 2006-16).

In order to gauge the investment policy trends in the period under study, analysis took into account the evolution of investment funds by category as stipulated by Portuguese Association of Investment Funds (APFIPP). The information collected thus spans four categories: Treasury Funds, Bond Funds, Equity Funds and Other Funds. In recent years, investor interest in channeling their savings into the investment fund market has been declining contrary to the trend in the bond and shareholder markets (APFIPP; CMVM, 2006-16).

This study is organized into five sections. In addition to this introductory, section 2 sets out the literature review before section 3 covers the methodology, a brief description of the sample, the model and the variables. The empirical part of section 4 then analyses the results with section 5 presenting the key conclusions.

2. Literature review

There have been difficulties in building up a consensus among the authors about the respective relevance of the different inducers of fund profitability. Despite these differences, we did note that a significant number of studies focused on three inducers: the commissions, size and age of the funds. Of lesser but still significant importance are the level of risk, the portfolio turnover, the Euribor and the benchmark.

As regards commissions, Makni et al. (2016) argue that the manager's experience and ability in asset selection accounts for a highly important factor in generating positive returns against high commissions. In the opposite direction, Golec (1996) and Redman et al. (2017) report that increases in personnel and transaction costs do not attain sufficient significance to provide positive returns. In turn, Chen et al. (2004) and Leite & Cortez (2017) find no evidence interlinking lower profitability with commissions.

In a US study, Moneta (2015) concludes that management fees establish a positive relationship with performance as managers are able to generate positive returns, sufficient to cover their fees and transaction costs, through channeling their investments into high-yielding assets. In the same vein, Stafylas (2016) points out that, to the extent that the interests of investors and managers coincide, increases in commissions do drive better performances. In turn, Dahlquist et al. (2000) and Otten et al. (2002) in studies of 210 Swedish funds and 500 funds in European countries, respectively, report that funds with higher commissions perform poorly. Grinblatt et al. (1994), on the other hand, did not find any relationship between performance and the commissions incurred in line with the results returned by Leite & Cortez (2009) following their study of 34 funds in Portugal and Europe during 2000-2007. Ferreira et al. (2012) also obtained similar results for a sample of 16,316 stock funds, from 27 countries for the period between 1997 and 2007 and by Low (2012) for 65 funds in Malaysia between 1999 and 2004.

Fund size is another variable subject to study and leading Ramasamy, & Yeung (2003) to identify this as one of the three most important factors for consideration in selecting funds. Bessler et al. (2016) and Hornstein et al. (2016) report that there is an inverse relationship between the fund's profitability and its size as a result of diseconomies of scale driven by management conflicts and increased costs. However, Glosten & Harris (1988) put forward evidence that larger funds do provide economies of scale as fixed costs can be shared, and managers trade larger volumes of capital able to benefit from reductions in the spreads with positive impacts on lowering operating costs. In the same sense, Otten et al. (2002), Redman et al. (2007), Ferreira (2012) conclude that larger funds perform better as they enjoy greater portfolio diversification, lower transaction costs, and economies of scale in addition to the scope for easier access to international markets, which is conducive to better, geographically unlimited, investment opportunities. In turn, Yan (2008) reveals a negative impact, which may result from high portfolio liquidity, generated by diseconomies of scale. These results are in line with Pollet et al. (2008), who refer to organizational diseconomies as the main determinants of profitability. The increasing amounts under management leads to the need for hiring new managers,

resulting in greater problems over coordination and lower efficiency levels. In turn, Malkni et al. (2016) and Phillips et al. (2017) encounter no relationship between fund size and performance and correspondingly suggesting that size should not be taken into consideration when selecting funds for a portfolio.

Another inductor targeted by several studies is the fund age, which establishes a mixed relationship with performance. On the one hand, funds with only a few years of life, and still in an initial phase, make greater investments in marketing policies, hold less negotiating power in asset transactions and go through a period of learning, all translating into increased costs that negatively influence performance (Blake et al., 1998). On the other hand, Stafylas et al. (2016) report that younger funds develop strategies to survive in the market, thereby achieving better returns. Bauer (2005), in analysis of German, British and US funds, notes that funds in the first three years of activity perform poorly before describing how they go through a recovery phase until turning in positive performances (younger funds may be negatively impacted by the learning period), in line with the results obtained by Dietze et al. (2009). In turn, Malkni et al. (2016), when analysing and performance of Islamic funds between 1999 and 2012, identifies how the lack of manager experience and higher costs may be behind the worse performance levels, particularly by newer funds. Contrary to these results, Otten et al. (2002) return evidence that younger funds perform better, adding value to the investor, especially when managed by experienced managers in line with Ferreira et al. (2012) who identify how the most recent funds develop strategies for market survival and thereby obtain better returns. Other studies (Chen et al., 2004, Prather et al., 2004, Ferreira et al., 2012 and Low, 2012) do not identify any relationship between age and performance.

The risk factor is another determinant of fund profitability according to some studies carried out in this area. The Markowitz Portfolio Theory states that as the level of risk increases, investors expect their investments to be more profitable in keeping with the findings obtained by Low (2012) and Babalos et al. (2015) detailing how as risk managers become more efficient, then they attract more investors. On the other hand, Golec (1996), in a study of 530 funds in the USA between 1988 and 1990, concludes that the increased level of risk returns a negative impact on performance with the risk levels associated to different portfolios dependent on both manager preferences and ages.

In relation to portfolio turnover, some studies (Dahlquist et al., 2000 and Cici et al., 2017) report that higher turnover enables managers to identify better investment opportunities in undervalued funds with a positive impact on performance. Carhart (1997) concludes in the opposite direction, pointing out that funds with higher levels of turnover perform worse as the increase in portfolio turnover leads to higher transaction costs that fail to get compensated by performance when taking into account the differentials between the prices of asset purchases and sales. In turn, Droms et al. (1996) and Low (2012) do not identify any statistically significant evidence. In their study of the Euribor, Redman et al. (2007) report a negative relationship with performance, noting that a sharp decline in the US Federal Reserve interest rate and diversification factors correlate with higher returns. On the other hand, Leite & Cortez (2009) did not identify any such relationship when deploying the Euribor as their short-term interest rate indicator.

Finally, the benchmark emerges as another inductor subject to study in the form of a market benchmark. Dietze et al. (2009) points out that funds are able to outperform the market index before incurring their respective commissions but the positive overall return to investors falls short of covering the aforementioned costs. Contrary to these

conclusions, Clare (2015), in a study of 357 funds between 2005 and 2014, report a positive impact between the benchmark and performance. They detail evidence of higher returns from funds with lower management fees and lower liquidity levels. They also account for better performances by funds run by a single manager, male and with over a decade of experience.

The following table attempts to summarize the main contributions identified in the literature review.

TABLE 1. SUMMARY TABLE OF BIBLIOGRAPHIC REFERENCES

VARIABLE	RESULTS	AUTHORS
COMMISSION	Negative relationship - there is a negative impact of the performance fee on fund returns.	Gil-Bazo et al. (2009), Drago et al. (2010),
	Positive relationship - managers are generally able to generate positive returns, sufficient to cover their fees and transaction costs as they direct their investments into high yield assets.	Moneta (2015), Stafylas et al. (2016), Makni et al. (2016)
	Absence of relationship - does not identify any relationship between performance and the commissions charged as the results obtained before and after commissions are similar.	Leite & Cortez (2009), Ferreira et al. (2012), Leite & Cortez (2017)
DIMENSION	Negative relationship - the funds that do not reach a certain size cannot adopt aggressive negotiation strategies and encounter diseconomies of scale.	Dahlquist et al. (2000), Chen et al. (2004), Yan (2008), Bessler et al. (2016), Hornstein et al. (2016), Stafylas et al. (2016)
	Positive relationship - larger funds perform better as they benefit from a greater capacity to diversify the portfolio and lower transaction costs (economies of scale).	Ciccotello (1996), Otten et al. (2002), Dietze et al. (2009),
	Absence of relationship - finds no relationship between the fund size and performance.	Makni et al. (2016); Phillips et al. (2017)
RISK	Negative ratio - the increase in risk is not offset by higher returns as the portfolio risk depends on the preferences and age of their managers.	Golec (1996)
	Positive relationship - funds with a higher level of risk perform better as risk managers are more efficient and can attract more investors.	Low (2012), Babalos et al. (2015)
AGE	Negative relationship - there is an ideal moment for the purchase of an asset that is dependent on the market conditions prevailing.	Stafylas et al. (2016),
	Positive relationship - funds in their initial phase make greater investments in marketing policies, hold less bargaining power in asset transactions and remain in a learning process that reflects in increased costs.	Blake et al. (1998), Bauer (2005), Dietze et al. (2009), Makni et al. (2016)
	Absence of relationship - does not identify any relationship between age and performance.	Chen et al. (2004)
PORTFOLIO ROTATION	Negative ratio - increasing portfolio turnover provides an increase in transaction costs.	Carhart (1997)
	Positive relationship - establishing a positive relationship between portfolio turnover and performance as the increase in transaction volumes correlates with higher efficiency and reduced trading costs.	Dahlquist et al. (2000), Cici et al. (2017)
	Absence of relationship - no relationship between rotation and performance.	Low (2012)
BENCHMARK	Negative ratio - funds are able to outperform the market index but only before applying their respective commissions with the overall positive return for investors failing to cover these costs.	Berk et al. (2004), Dietze et al. (2009)
	Positive relationship - reports a positive impact between benchmark and performance. This reports a higher return on funds with lower management fees and lower liquidity volumes.	Clare (2017)
EURIBOR	Negative ratio - motivated by the diversification factor and the sharp drop in the Federal Reserve interest rate.	Redman et al. (2007)
	Absence of relationship - no relationship between Euribor and performance.	Leite & Cortez (2009)

3. Sample, data, and methodology

Out of all the respective studies carried out on this subject, we may state that the Portuguese market has been subject to little exploration. Of the few known studies, the work done by Leite & Cortez (2009) is worth noting with their study of 34 European funds, 13 of them Portuguese, as reported by Ferreira et al. (2012). However, these authors do not draw any individual conclusions for each country. More recently, Leite & Cortez (2017) also covered bond fund profitability.

Our methodology began by investigating just which financial institutions / management companies operated in Portugal in accordance with the APFIPP website and the CMVM, the local regulator. Later, we needed to obtain authorization from the respective management companies via APFIPP in order to disclose some of the information necessary for this work to advance, including the value of fund participation unit prices. Afterwards, we were in a position to establish a sample of 78 active investment funds, classified into four types: stocks, bonds, treasury and mixed (in keeping with the methodology applied by Dahlquist et al., 2000), overcoming most of the limitations of the studies hitherto carried out that focused primarily on the stock market.

The literature review verified that a significant proportion of the articles published stemmed from applying the alpha, the performance measurement put forward by Jensen in 1968. Although this incorporates certain limitations as it rests on two explanatory factors (such as market return and risk measurements), this indicator by far represents one of the most commonly applied measures that best enables evaluations of investment fund performance levels. Alpha conveys the excess returns from any portfolio and the returns according to the benchmark (i.e., the market index) (Ferson & Schadt, 1996). When we return positive alphas, this demonstrates the presence of an asset performing better than the market adjusted performance, however, when they turn negative, this indicate a contrary level of performance.

Jensen's Measure:

$$R_{i,t} = \alpha_i + \beta_i Rm_t + \varepsilon_{i,t} \quad , \quad (1)$$

Where,

$R_{i,t}$ - Profitability of asset i at time t ;

α_i - Measure of profitability of asset i that is unrelated to the market at time t ;

β_i - Sensitivity of asset i profitability to market variations;

Rm_t - Market profitability at time t ;

$\varepsilon_{i,t}$ - Random component of asset i profitability;

e_R - residuals of restricted model; e_U - residuals of unrestricted model; r - number of restrictions; Obs - number of observations in the model

Based on the Fama & French (1993) study, we were able to overcome the Jensen (alpha) limitations presented as the introduction of multi-factors can become determinant to the results. To evaluate fund performance, we applied a 7-factor model to compare the returns of each fund against different variables in keeping with the study by Dahlquist et al. (2000). The variables employed here are the portfolio size, the management fees, the fund age, the fund risk class, the portfolio turnover, the EURIBOR rate and the benchmark performance to consider whether the fund was performance targeted. In order to obtain information on the characteristics of each fund, we made recourse to several sources with the profitability of each fund and the dividend distributed obtained from APFIPP, with prior authorization from the management entities, or from IM Gestão de Ativos, SA (IMGA) in the case of Millennium BCP (Banco Comercial Português). We collected the overall net value, volume, portfolio turnover, number of fund years, type of fund, commission and level of risk through individual analysis of the prospects and reports and accounts available on the CMVM website. The Euribor rate was obtained from the site European Markets Money Institute (EMMI) with the benchmark associated to each fund rated by Morningstar and its value obtained from Bloomberg.

We divided the calculation of the dependent variable - Jensen's alpha into two phases. In the first step, we had to collect data from the CMVM and, following the agreement of the respective management, information on the unit yields of the daily quotations for each investment fund, net of commissions, but gross of any transaction charge and as identified in the fund's respective dividend. This information was collected from the entity itself. Subsequently, monthly profitability adjusted to the dividend and calculated according to the following formula as proposed by Leite & Cortez (2009):

$$R_{p,t} = [(UP_{p,t} + D_{p,t})/UP_{p,t-1}] \quad (2)$$

Where,

$R_{p,t}$ - Monthly net fund yield;

$UP_{p,t}$ - Value of the unit of the fund for period t ;

$UP_{p,t-1}$ - Value of the unit of fund for period $t - 1$;

$D_{p,t}$ - Unit dividend paid by the fund for period t ;

In the second stage, we then calculated the monthly profitability for the market index. To this end, we applied the Morningstar ranking to find the most appropriate index for each fund and then collected information from Bloomberg about its monthly quotation value. For the monthly profitability calculation, we deployed the following:

$$R_{m,t} = \ln(M_{m,t}/M_{m,t-1}) \quad (3)$$

Where,

$R_{m,t}$ - Monthly yield of the Index;

$M_{m,t}$ - Market Index Value for period t ;

$M_{m,t-1}$ - Market Index Value for period $t - 1$;

As regards the model's explanatory variables and in order to ascertain the best model, we proceeded to inverse some variables (rotation) and logarithms (dimension, years and benchmark value) thus bringing about a smoothing of the variables in accordance with the methodology followed by Chen et al. (2004) and Ferreira et al. (2012). Size (dimension) represents the total net value, thus, the total value of the funds in the portfolio, minus fees and commissions, including expenses related to the purchase and sale of assets, legal and fiscal charges, supervisory fees and costs deriving from audits through to the moment of the portfolio's valuation. We would note that the sample under study contains much larger amounts under management in treasury funds and bond funds in comparison with the mixed and stock funds. This may be due to the increased risk of the assets incorporated into each category (see Table 2).

The commissions paid out by the funds are included in the unit value of each fund. These costs include the management fee (management entity charges for the services provided), the deposit commission (remuneration for the registration services and holding the assets included in the fund), the supervisory fee and any other asset purchase and sale operating costs, as well as any taxation due), and with any transaction costs excluded. The amounts presented are expressed as a percentage that refers to the annual rates for each year.

From this study, we may report that the highest commissions are levied on equity funds and mixed funds and the lowest on treasury funds. On average, the stock funds apply a 1.91% commission, presenting a minimum value of 0.35% and a maximum value of 3.04%, contrary to, as might be expected, the average treasury fund commission of 0.58% (see Table 2). The Average Portfolio Turnover stems from the total value of the acquisitions and disposals of each fund in the last complete financial year, divided by the net monthly average value of the fund in that same year. The higher the turnover, the more active the manager's role in the investment fund. In the sample, bond funds register the greatest turnover, followed by stock and treasury funds. In turn, mixed funds are those with the lowest average turnover (see Table 2). The number of years of the fund, from its launch to the year under review provides the fund age. The average age for the fund sample under study is about twelve years for equity and bond funds, and about nine years for treasury and mixed funds. We may also conclude that there is a wide variation in the age of the funds, as the sample contains both recently launched funds and funds with more than two decades of activity (see Table 2).

The Risk Level is classified according to the portfolio composition of each fund and the volatility it assumes over each year. Information on the risk level has been sourced from the annual forecast for the following year published by each management company and classified according to a risk scale of 1 to 7 with funds classified as scale 1 incurring very low risks while scale 7 funds indicate a much higher risk.

In keeping with each fund's investment policy, it seemed probable that the risk in the sample would be higher in equity funds and mixed funds and lower in bond and treasury funds. In this way, stock funds received a maximum level of risk 7 with the mixed funds at 6 due to the stock component constituting the portfolio. In turn, this attributed bond and treasury funds with a maximum risk level of 4 and 3 respectively, according to the characteristics of each fund (see Table 2). The Euribor is the average interest rate on interbank lending in euros for about 25 to 40 European banks. The value presented is

annual and calculated according to the monthly reference rate average at 1 month for each year under study. This data came from the EMMI (European Money Markets Institute) website. Over the ten years under study, we encountered great fluctuations in the EURIBOR rate, largely due to the economic policies introduced in member states as a consequence of various crises. The maximum level reached 4.28% with the lowest coming at -0.34% with an average in the region of around 1%, indicating a low level for most of the period reference rates (see Table 2).

TABLE 2. STATISTICAL SUMMARY OF THE VARIABLES UNDER STUDY

VARIABLES	TYPE OF FUND	N	AVERAGE	MINIMUM	MAXIMUM
SIZE (THOUSANDS EUROS)	Funds Stocks	296	29,900,000	968,479	338,108,307
	Funds Bonds	122	760.00,000	1,439,792	940.694.105
	Funds Mixed	218	31,600,000	475,461	623,796,841
	Funds Treasury	88	149,000,000	741,180	1,385,218,760
COMMISSIONS (%)	Funds Stocks	296	1.91%	0.35%	3.04%
	Funds Bonds	122	0.97%	0.31%	2.65%
	Funds Mixed	218	1.69%	0.11%	4.16%
	Funds Treasury	88	0.58%	0.16%	0.92%
AGE (YEARS)	Funds Stocks	296	11.78	0	26
	Funds Bonds	122	12.09	0	23
	Funds Mixed	218	8.83	0	21
	Funds Treasury	88	8.99	0	26
RISK	Funds Stocks	291	5.27	2	7
	Funds Bonds	117	2.26	1	4
	Funds Mixed	211	3.40	2	6
	Funds Treasury	83	1.19	1	3
ROTATION	Funds Stocks	296	212%	0%	1720%
	Funds Bonds	122	309%	20%	3837%
	Funds Mixed	218	161%	10%	2061%
	Funds Treasury	85	216%	0%	3070%
EURIBOR	Funds Stocks	296	1.17%	-0.34%	4.28%
	Funds Bonds	122	1.07%	-0.34%	4.28%
	Funds Mixed	218	1.06%	-0.34%	4.28%
	Funds Treasury	88	0.83%	-0.34%	4.28%
BENCHMARK	Funds Stocks	296	2.46%	-74.54%	62.52%
	Funds Bonds	122	3.61%	-5.22%	14.40%
	Funds Mixed	218	3.77%	-48.37%	35.40%
	Funds Treasury	88	0.72%	-5.22%	14.40%
ALPHA	Funds Stocks	296	-0.01%	-53.24%	20.88%
	Funds Bonds	122	-0.82%	-19.91%	58.93%
	Funds Mixed	218	-0.97%	-43.60%	16.15%
	Funds Treasury	88	1.08%	-14.50%	11.47%

Source: Descriptive statistical data summarized from the "sum" function of Stata.

The Benchmark is a standard for measuring the performance of an instrument, product or financial application. It often consists of stock price indices or bonds or interest rates. As previously mentioned, following the application of the Morningstar (2017) classification, the respective benchmark was assigned to each fund making up the sample. Given the impossibility of collecting all information, an index was chosen that best represented the market portfolio. We collected information on the monthly value of each index from Bloomberg. In order to calculate annual profitability, we made recourse to the equivalent

of expression 3. As regards market indices, as might be expected, we also encounter sharp fluctuations in stock funds and mixed funds. We may report minimum values of -74% and -48% and maximum values of 62% and 35%, respectively. Bond funds and treasury funds display smoother and smaller variations. Despite the differentials in the presented values, we verified average profitability for the decade long sample of between 1% and 3.5% (see Table 2). In Appendix 1, the reader may observe further information about the benchmarks applied in the study according to the rating obtained from Morningstar.

The following table is a statistical synthesis of the variables under study respectively detailing the number of observations, the average, the minimum and the maximum of each variable by fund type.

The sample under study verifies how stock funds account for the greatest number of observations, potentially due to their more aggressive investment policy, turning them into one of the products most demanded by less conservative investors and leading companies to intensify their range of this portfolio type as they manage to obtain higher margins by charging higher commissions. Nevertheless, this category would seemingly be of less interest to investors in general it holds a lower total value under management. These funds also hold the longest operational track record with an average of twelve years in conjunction with bond funds. Contrary to this trend, treasury funds continue to receive the highest level of demand, to the detriment of other types, obtaining the highest value under management and returning lower management costs. Treasury funds were the only type to report positive and superior returns to the Market Index during the sample period. All other types fell short of expectations not only with negative returns but also much lower than the associated Market Index.

The proposed model for our study is as follows:

$$\alpha_{i,j} = \beta_1 + \beta_2 dim_{i,t} + \beta_3 com_{i,t} + \beta_4 id_{i,t} + \beta_5 ris_{i,t} + \beta_6 rot_{i,t} + \beta_7 eur_{i,t} + \sum_{j=1}^{20} \beta_{7+j} bench_j + valbench_{i,t} + \varepsilon_{i,j} \quad (4)$$

Where,

i - fund i ; t - time period t ;

α - Annual profitability alpha at time t ;

$\beta_{i,t}$ - coefficients derived from linear regression via OLS and relating to each variable and that measure the sensitivity of the dependent variable to changes in the independent variable corresponding to the fund, i.e. in period t ;

dim - amount (size or dimension of the fund) under fund management i at time t ;

com - total rate charged from fund i at time t ;

id - number of fund years of fund i at time t ;

ris - risk associated class of fund *i* at time *t*;

rot - average rotation of the fund 's portfolio *i* at time *t*;

eur - fund's Euribor rate *i* at time *t*;

bench - name of the benchmark associated with fund *i*;

valbench - benchmark profitability associated with fund *i* at time *t*.

We applied the annual data for analysis according to the statistical panel data approach, also known as longitudinal data, Dahlquist et al. (2000). In the case of fixed effects, the estimations assume that the constant part captures the heterogeneity of individuals, that which differs from individual to individual. In turn, the random effects assume the heterogeneity of individuals in a random way independently of any errors, that is, the observations are not correlated, Greene (2002). We performed the Hausman test to ascertain the most proper model for study and correspondingly concluding that this would be the fixed effects regression estimator, despite its reduction of the degrees of freedom with the presence of dummy variables. The Hausman test rejected the H0 hypothesis (random effects), concluding that fixed-effect estimators are preferable over random effects.

The sample contains 78 investment funds in Portugal (managed and marketed by entities domiciled in the national territory) studied over a ten year period between 2006 and 2016. We identified the funds through the APFIPP and CMVM websites and considering only funds that were active on December 31, 2016.

The main reason for the sample beginning in 2006 derived from how, for any prior years (2004/2005), the collection of the information necessary for this study would have been difficult, if not impossible, to obtain as only after that were date management entities obliged to improve and expand the information available on investment funds through prospectus, reports and accounts. According to the literature review, there is agreement concluded that ten years of analysis is sufficient to obtain consistent conclusions. We considered a total of 724 observations (year / fund).

In keeping with the study by Dahlquist et al. (2000), we classified the funds by typologies and subcategories in order to identify any possible relationships with performance. According to the criteria applied by the CMVM on its website page and each fund's prospect, we were able to classify them by the following typologies: Funds of Stocks; Mixed Funds; Bonds Funds; and Treasury Funds. Assets classification took place according to the composition of the investment fund portfolio, thus obliging periodic reviews as they might undergo significant changes in the agreed investment policy and with the corresponding need for the necessary adjustments.

According to a study produced by APFIPP, equity funds invest at least 80% of their portfolios in shares issued in accordance with the investment policy, bond funds invest at least 80% of their portfolios in bonds and / or other securities representing debt and with treasury funds investing in assets characterized by high liquidity, and with more than 50% of their portfolios invested in securities and time deposits with a maturity of less than one year. According to the APFIPP fund descriptions, we then classified these into subcategories: PPR (Savings Retirement Plan); Funds Flexible; International Bond Funds; European Union, Switzerland and Norway Bond Funds; Euro; Multi Funds Active; Short Funds Term; North America Stock Funds; Stock Funds National; Bond Funds Rate

Indexed; Sector Stock Funds; Other International Stock Funds; PPA Funds (Share Savings Plans); FIA (Alternative Investment Fund) Absolute Return; Other FIAs; FIA Bonds.

Our sample details show that a large part of the collected sample primarily invests in Stock Funds and Mixed Funds, representing about 70% of the total value, thus with about 30% allocated to Bond Funds and Treasury Funds, i.e. 54 and 24 funds respectively. Of the 29 Stock Funds observed, 45% of the sample is concentrated mainly into European Union, Switzerland and Norway Stock Funds, Sectoral Stock Funds and other International Stock Funds. In turn, of the 25 mixed funds making up this sample, over 50% is allocated to Multi Asset Funds. In the 14 bond funds, the Euro Bond Funds predominates with a 43% weighting.

4. Empirical results

This chapter analyses the statistical significance of the inductors that condition the performance of investment funds according to a multi-factor panel data regression model, based on Jensen's (1968) measure with the necessary adaptations, in line with other studies, for example Dahlquist et al. (2000) and Low (2012).

TABLE 3. RESULTS OBTAINED FROM ESTIMATING THE STUDY SAMPLE

alpha	Coef.	Std.	t	P> t	[95% Conf.Interval]	
<i>dim</i> (logvlgf)	.0087619	.0048758	1.80	0.076	-.0009512	.0184749
<i>rot</i> (rotinv)	.0025223	.0012987	1.94	0.056	-.0000649	.0051095
<i>id</i> (loganos)	-.0333852	.0136733	-2.44	0.017	-.0606238	-.0061465
<i>com</i>	4.527684	2.144573	2.11	0.038	.2554746	8.799893
<i>ris</i> (risk)	-.034677	.0074635	-4.65	0.000	-.049545	-.019809
<i>eur</i>	-3.199225	.5663686	-5.65	0.000	-4.327489	-2.070961
<i>bench6</i>	.054143	.0711358	0.76	0.449	-.0875668	.1958528
<i>bench7</i>	-.0111218	.0382506	-0.29	0.772	-.0873208	.0650772
<i>bench8</i>	.0787166	.0441488	1.78	0.079	-.0092323	.1666656
<i>bench9</i>	.0399159	.045023	0.89	0.378	-.0497745	.1296064
<i>bench10</i>	-.0272898	.0123418	-2.21	0.030	-.0518759	-.0027037
<i>bench11</i>	.0893368	.0323654	2.76	0.007	.0248616	.153812
<i>bench13</i>	.1537231	.0600484	2.56	0.012	.0341005	.2733458
<i>bench14</i>	-.0143741	.0467428	-0.31	0.759	-.1074905	.0787423
<i>bench15</i>	.0537417	.0430297	1.25	0.216	-.0319779	.1394614
<i>bench16</i>	-.0356554	.0104068	-3.43	0.001	-.0563868	-.0149241
<i>bench17</i>	-.0378052	.0107908	-3.50	0.001	-.0593015	-.0163088
<i>bench18</i>	.1071743	.0363209	2.95	0.004	.0348193	.1795293
<i>bench19</i>	.1198164	.0218853	5.47	0.000	.0762187	.1634141
<i>valbench</i> (logvalbench)	-.0029238	.0040798	-0.72	0.476	-.0110512	.0052036
_cons	-.0134808	.0742115	-0.18	0.856	-.1613176	.134356
sigma_u	.05848266	R- sq: within =0.2416; between=0.1071; overall=0.1247 number of obs: 533; corr (u_i ,Xb) -0.6951				
sigma_e	.07629642					
rho	.37009913					

Source: Results obtained in the Stata program.

We incorporated some dummy variables so as to capture the potential benchmark effect and contributions to the model, as well as their influences on performance. Hence, the qualitative variables underwent transformation into binary variables. Following analysis of these results, we were able to measure for significance at the level of 10%, a p-value <0.1 , for the variables dimension (size), rotation (with the latter at almost 5%) and the S&P 500 benchmarks. A significance level of 5% (p-value <0.05) for age, commissions, MSCI World Financials Index and Russell 1000 Growth benchmarks and 1% significance for the risk and Euribor rates, the MSCI EM Bloomberg Barclay Euro Aggregate Corporate Total Return Index, MSCI Spain MSCI World Health Care and MSCI World / Telecom Services benchmarks. We would note that the dimension (size), when presenting a p-value of about 7%, may not attain statistical significance in terms of current statistical standards for performance justification. However, we address this justification by taking this into account in the potential influences on performance.

According to the results obtained, and without ignoring the low level of statistical significance, the dimension (size) may convey a positive relationship with performance. We may report larger funds return higher yields in line with the results obtained by Ciccotello (1996), Dietze et al. (2009) and Ferreira et al. (2012). The results suggest that the larger volume of funds under management benefit from economies of scale as fixed costs are then spread across a wider range of assets and in addition to gaining better investment opportunities, those available only for larger funds and correspondingly run counter to the conclusions of Indro et al. (1999), Bessler et al. (2016), Stafylas et al. (2016) and Hornstein et al. (2016). According to these authors, larger funds may encounter liquidity problems in illiquid markets, as well as economies of scale, suggesting that the funds, after reaching an ideal size, return only negative marginal returns. They also found evidence that increases in size tends to lead to the hiring of new managers that may cause management conflicts as the team grows. Indeed, according to Prather et al. (2004), Low (2012), Makni et al. (2016) and Phillips et al. (2017), there is no relationship between size and performance and therefore concluding that dimension should not be a criterion for selecting funds for a portfolio.

Analysing the inverse rotation results (*rot*), we may then verify that rotation generates a negative impact on the profitability given that, as asset trading volumes increase, performance levels decrease. Any increase in the difference between the purchase and selling prices (the spread) and a higher portfolio turnover only means more transaction costs and not offset by profitability, a finding also in keeping with the studies by Malkiel (1995) and Carhart (1997). These conclusions diverge from the results obtained by Grinblatt et al. (1994), Wermers et al. (2000) and Cici et al. (2017), that associate higher rotation levels with better performance levels as managers are able to seek out undervalued assets and detect good investment opportunities. They also demonstrate how increases in transaction volumes interlink with greater efficiency standards through reducing trading costs. Ippolito (1989) and Low (2012), in turn, report no relationship between rotation and performance.

In the case of fund age (*id*), there is evidence of a negative relationship between fund age and its performance. The studies by Otten et al. (2002) and Ferreira et al. (2012) and Stafylas et al. (2016) all suggest that recent funds tend to outperform their peers in operation for more years as younger funds develop strategies to survive in the market and are better able to detect investment opportunities. However, these results contradict the conclusions obtained by Bauer (2005) and Makni et al. (2016) as younger funds need to

invest more in advertising and research to identify those better investment opportunities. They also convey how such young funds have less negotiating power in asset transactions and go through learning periods when they are more exposed to risk and invest in a smaller number of assets. Older funds, meanwhile, have more stable cost structures and higher operational efficiency standards. On the other hand, Prather et al. (2004) and Low (2012) conclude there is no relationship between age and performance.

Our results here show that the commission (*com*) has a positive impact on fund performance in line with the results obtained by Droms et al. (1996), Moneta (2015), Stafylas et al. (2016) and Makni et al. (2016), in which higher commissions associate with higher performance levels as managers generally achieve sufficient returns to pay their fees and transaction costs. Manager experience also represents an important factor for better performance. On the other hand, Dahlquist et al. (2000) and Gil-Bazo et al. (2009) and Drago et al. (2010) conclude that funds with higher commissions tend to outperform funds with lower commissions. They also report that some funds perform better before the deduction of commissions but not at a level able to cover the charges before stating that funds charge very expensive commissions compared with the returns obtained. These authors furthermore add that managers opportunely change investment policies in order to increase incentives even if these efforts are sometimes unsuccessful. On the other hand, Low (2012) and Leite & Cortez (2017) did not find any such relationship. In our case, from the commissions representing manager remuneration, we may infer that the best performing funds tend to charge higher commissions.

These results indicate that the risk class (*ris*) displays a negative relationship with performance, in line with those obtained by Golec (1996), as the portfolio risk depends on the preferences and ages of managers and thus concluding that increases in risk do not translate into higher returns, thereby counteracting that expected by Markowitz's Portfolio Theory. Contrary to these conclusions, Low (2012) and Babalos et al. (2015) detail evidence of how funds with higher risk levels perform better as risk managers are more efficient and thus able to attract more investors.

The Euribor (*eur*) results convey evidence that this rate holds a negative impact on performance, in keeping with the study by Redman et al. (2007) that reports evidence of better performance levels in cycles of lower interest rates set by the Federal Reserve. As might then be expected, when the Euribor rises, funds have lower profitability levels, particularly those related to fixed income assets. In the case of stocks, interest rate increases increase potential financing charges not only reducing corporate profits but also increasing discount rates to discount flows and therefore reducing the asset values. Leite and Cortez (2009), did not find any such relationship.

The results suggest a positive relationship between the S&P 500, MSCI EM, Russell 1000 Growth, MSCI World / Health Care / Telecom Services benchmarks and performance, in line with the conclusions obtained by Grinblatt et al. (1989) and Clare (2015) that report evidence that some managers can outperform the market index. They conclude that better fund performances come from those with higher management fees, reduced volumes with lower liquidity and managed by a single manager. In turn, the MSCI World/Financials benchmark and the Bloomberg Barclays Euro Aggregate Corporate Total Return Index Value Unhedged EU benchmarks display a negative relationship with performance in accordance with studies done by Ferson & Schadat (1996), Berk et al. (2004) and Dietze et al. (2009), who conclude that fund profitability does not track the benchmark. However,

this failure should not be understood as an indicator of the manager's lack of ability but rather suggests the influence of increased transaction costs.

5. Conclusions

This study focuses on the profitability of investment funds in the Portuguese market and differs from previous research on this theme in terms of the significant number of explanatory variables incorporated, the size of the sample and the temporal range studied.

The results suggest that the larger Portuguese-traded funds have a greater volume of advertising investment, which favours the attracting of new investors, the hiring of better managers, selecting the best investment and portfolio diversification solutions in addition to positively influencing commissions, benefiting from economies of scale, and enabling the allocation of fixed costs across the greater number of funds under management.

The results also indicate that investors should seek passive management funds, thereby reducing transaction costs, as well as younger funds, which in early stages turn in better performances.

Regarding the risk class, the results indicate that funds with higher risks establish an inverse relationship with profitability.

Given the interest rate rise cycles, there is evidence of a decrease in performance, suggesting the need to adopt more conservative behaviours in the selection of assets, in particular purchasing fixed rate and stock bonds.

Given the general lack of research carried out on the investment fund context in Portugal, the incorporating of a significant number of explanatory variables and a longer time horizon lead us to conclude that this research contributes to deepening knowledge on these issues.

The main limitation of this study derives from the difficulty in collecting information due to the limitations imposed by current data protection legislation, which limited the analytical scope and depth and explains the lack of studies developed in economies similar to the Portuguese cases.

In view of the limitations presented, we believe that further research should ascertain the extent to which the characteristics of fund managers, including age, gender, academic qualifications, professional experience and overreliance on finance affect fund profitability. Finally, it would be interesting to compare, in different institutional contexts, the role that the inductors identified in this paper play in investment fund profitability.

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Appendix

TABLE 1A. BENCHMARKS BY CATEGORY

CATEGORY	BENCHMARK			DESCRIPTION
NATIONAL STOCK FUND PPA FUNDS	PSI20 Index			Portuguese Stock Index - This is the main reference index of the Portuguese market, representing the 20 largest companies listed on the Lisbon stock exchange. It currently comprises 18 stocks following the various financial system restructurings.
NORTH AMERICA STOCK FUNDS	S&P 500			Standard & Poor's 500 - is one of the benchmark indices in the United States, and is made up of the 500 largest companies by stock market capitalization.
	Russell 1000 Growth TR USD			Russell 1000 Total Growth Return Index, which represents the 1000 largest companies in the United States market and ranked as a reference index.
STOCK FUNDS FROM E.U., SWITZERLAND AND NORWAY	MSCI Spain NR EUR			Index that measures the performance of medium and large-cap companies in the Spanish market, representing around 85% of total shares.
	MSCI EUR	Europe	NR	Index consisting of 445 shares of the 15 most developed countries in Europe and medium and large companies by stock market capitalization across several segments and sectors.
FIA ABSOLUTE RETURN FLEXIBLE FUNDS				
OTHERS: INTERNATIONAL STOCK FUNDS	TOPIX TR JPY			Stock market index of the Tokyo Stock Exchange, made up of the largest companies in Japan.
	MSCI AC Asia Pac Ex JPN NR USD			Index consisting of 722 medium and large companies by capitalization from four developed market countries and nine emerging market countries.
	MSCI EM NR USD			Index representing the 846 medium and large companies by capitalization in 24 emerging countries.
	MSCI World			Index comprising of 1649 medium and large companies by capitalization from 23 developed countries around the world, excluding stocks from emerging economies.
OTHERS FIA				
SECTOR STOCK FUNDS	MSCI World/Financials			Index that represents medium and large companies by capitalization in the financial sector in 23 countries with developed markets.
	MSCI World/Health Care NR USD			Index that represents medium and large companies by capitalization in the health sector of 23 developed countries.
	MSCI World/Telecom Services NR USD			Index that represents medium and large companies by capitalization in the telecommunications sector of 23 developed countries.
	MSCI World/Utilities NR USD			Index that represents the medium and large companies by capitalization of the utilities sector of 23 developed countries.
EURO INDEXED RATE BOND FUNDS	Bloomberg Barclays Euro Aggregate Corporate Total Return Index Value Unhedged EU			Index representing fixed-rate corporate debt securities denominated in euros, with a maturity of more than 1 year.
BONDS FIA				
EURO BOND FUNDS	Bloomberg Barclays EuroAgg Total Return Index Value Unhedged EUR			Reference index that measures the degree of investment of euro-denominated fixed rate securities, including sovereign and corporate debt securities.

Source: Own elaboration.